



# **Simulation Based Acquisition:**

# **SMART**

**(Simulation & Modeling for Acquisition, Requirements, &  
Training)  
For the Army**

at

## **The University of Texas**

Dr. Herbert K. Fallin, Jr.

Director

Office of Assessment & Evaluation

OASA(RDA)



# Why Are We Here?

Provide Update on RDA  
M&S Domain Initiatives



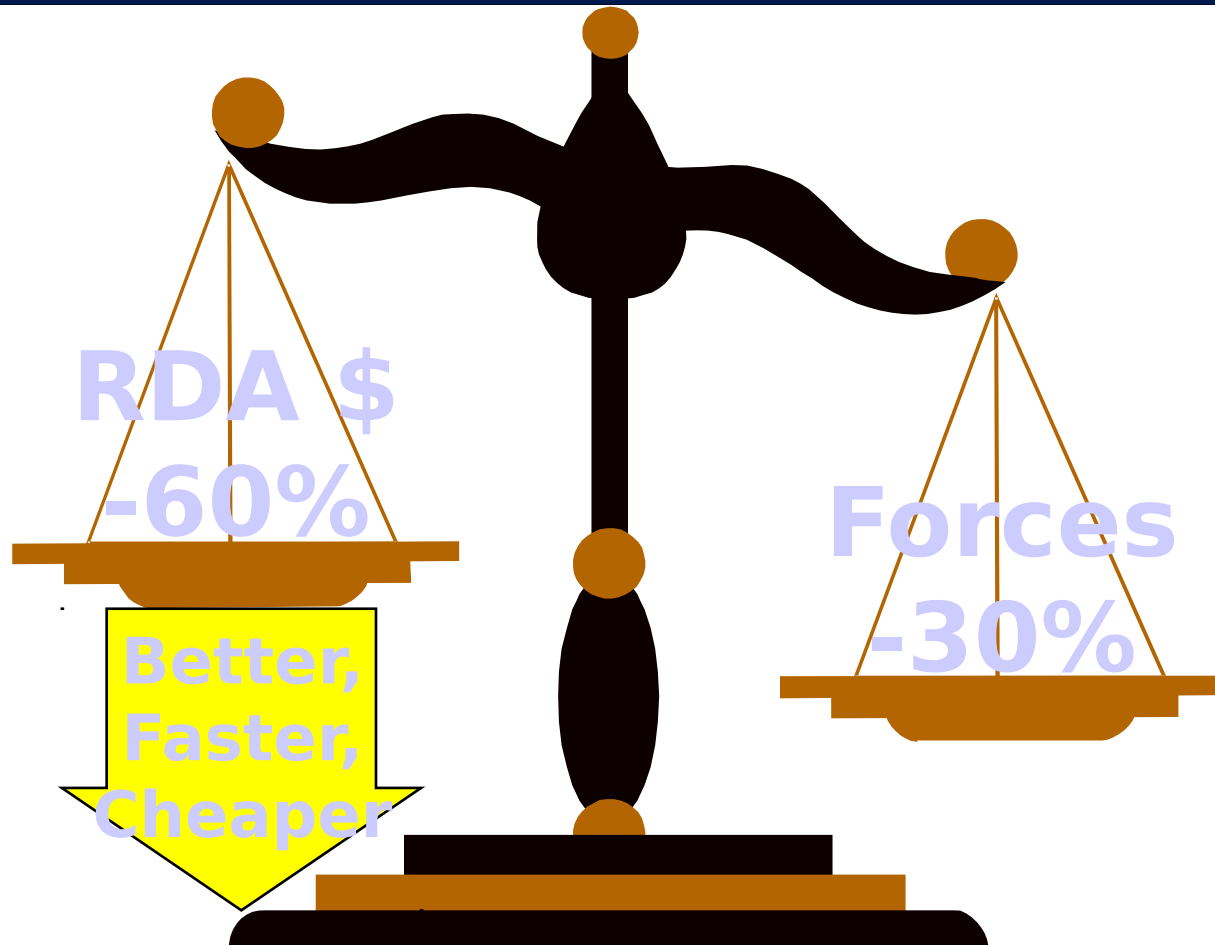
# Army Acquisition Vision

**The World's Best** All spectrum  
**force - trained** history. A  
**Total Force**  
**civilians:**

- A values
- An integ
- Equippe
- Equipme
- Country
- Able to re
- Changing
- tomorrow....
- the 21st Centu

*A dynamic organization  
that provides the warfighters  
affordable world class weapon  
systems and services years before  
any adversary can acquire comparable  
technological capability. Systems are  
continuously modernized and the cost  
of ownership drastically reduced  
each year. Quality people, teamwork  
and caring leadership are the  
heart of the Army  
Acquisition Organization.*

# Challenge

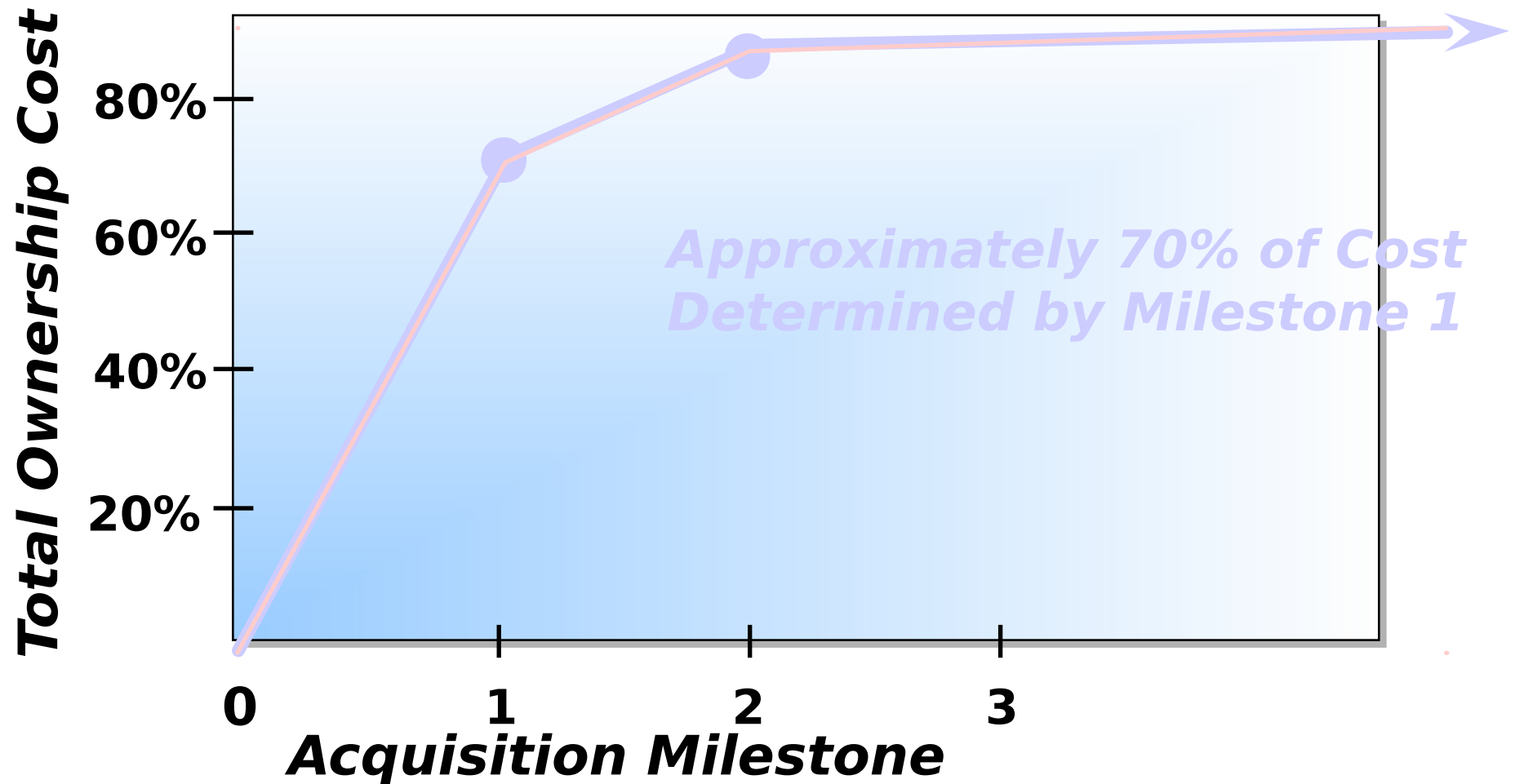


*Continue Force Modernization with Fewer RDA Dollars*

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SBA Implementat  
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# Challenge



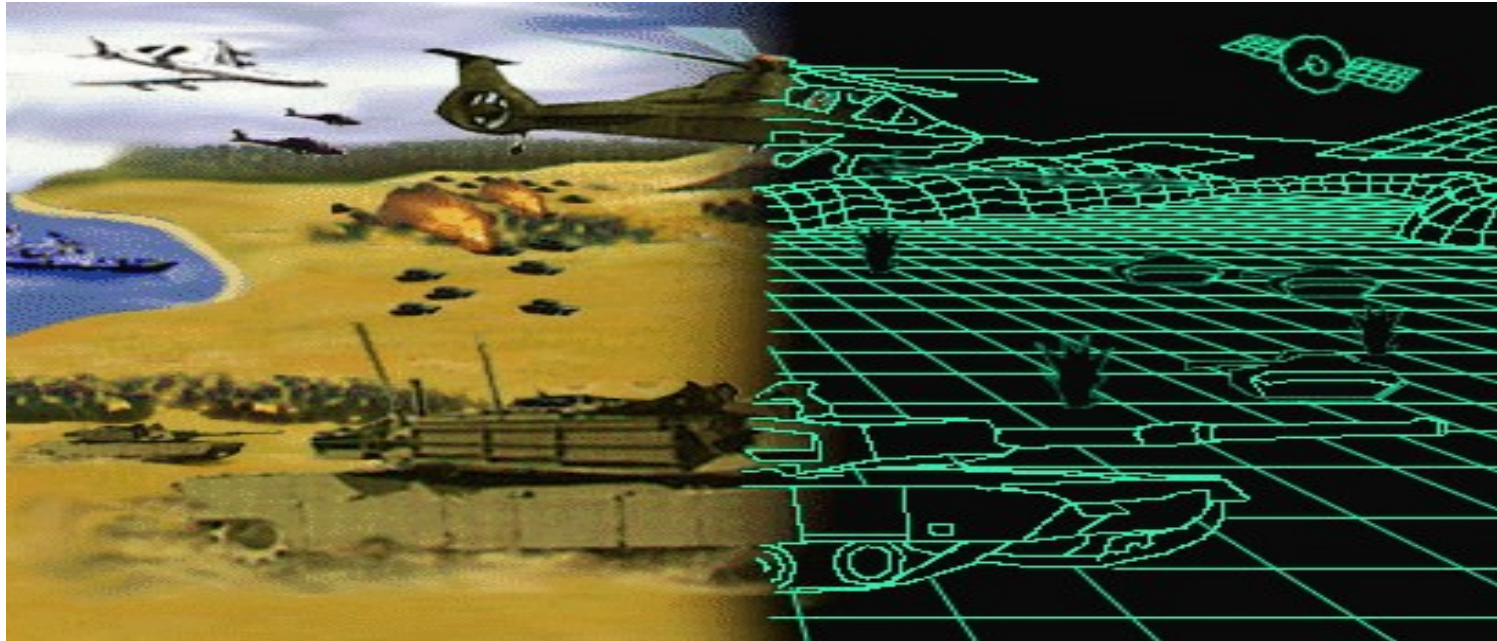
*Up Front and Continuous Attention Needed on Ownership Costs*

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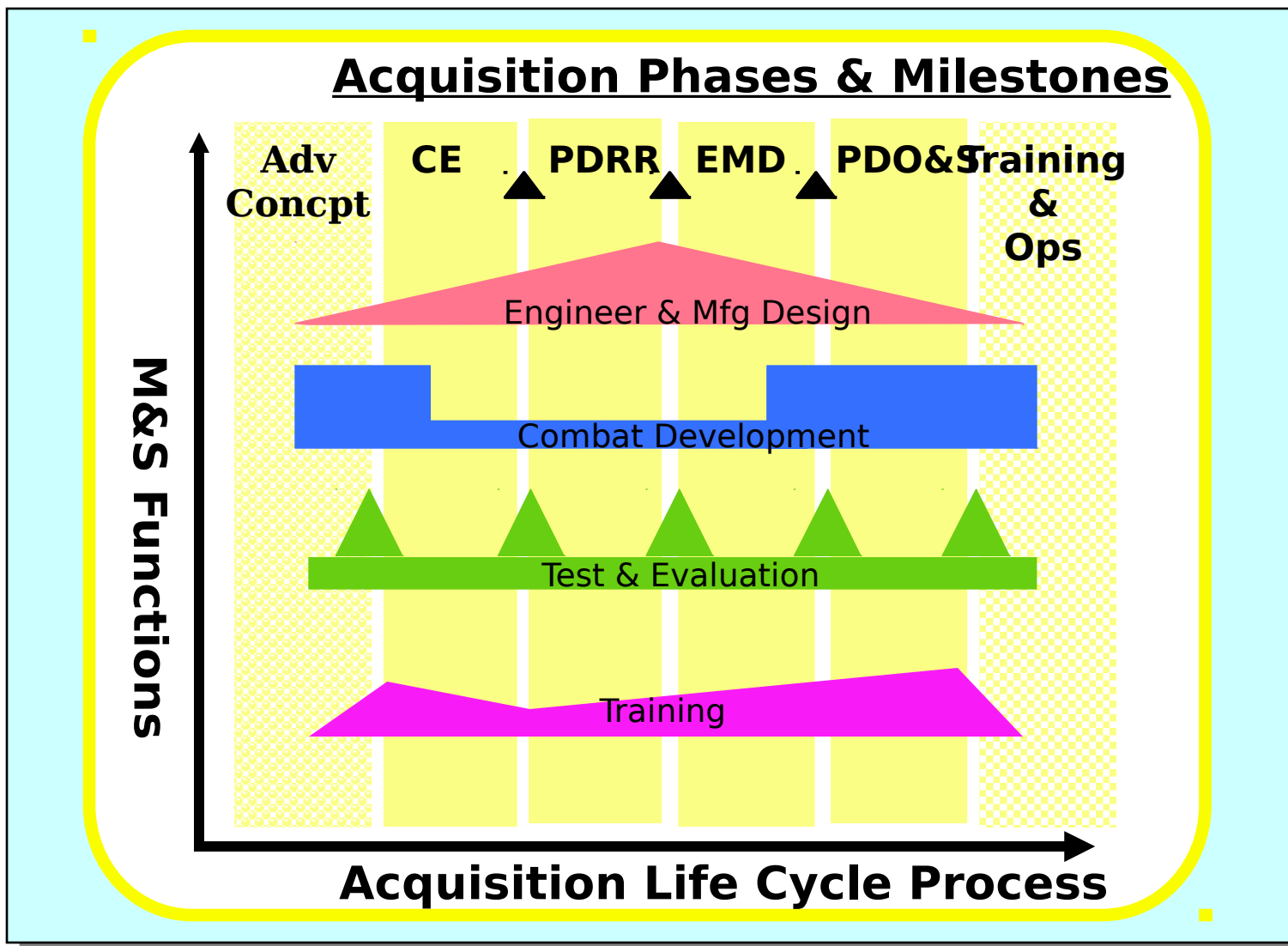
# SBA - What is it?



**SBA is the integrated process, culture, and environment through which quality products are rapidly and economically developed, fielded and sustained. *Modeling & Simulation enables the execution of SBA through robust, collaborative use of tools and technology across acquisition phases and functions and across acquisition programs.***



# SBA - What is it?





# OSD Perspective

## **Dr.. Jacques Gansler, USD (A&T):**

“...We must take bold, innovative strides to encourage increased collaboration and leverage available and developing simulation technologies...”

## **Mr.. R. Noel Longuemare, Former Principle Deputy to USD (A&T):**

“....encourage an increasing emphasis on the use of M&S....to reduce cost and schedule....A key initiative is the concept of Simulation Based Acquisition...”

## **Defense Systems Affordability Council:**

SBA is one of 3 key initiatives to reduce Total Ownership Cost and time to Initial Operating Capability by 50%





# Computer Aided Design: Boeing 777



- **100% Digital Design**
  - CATIA, ELFINI, EPIC
- **FlyThru Allows for Faster, Less Expensive Assembly**



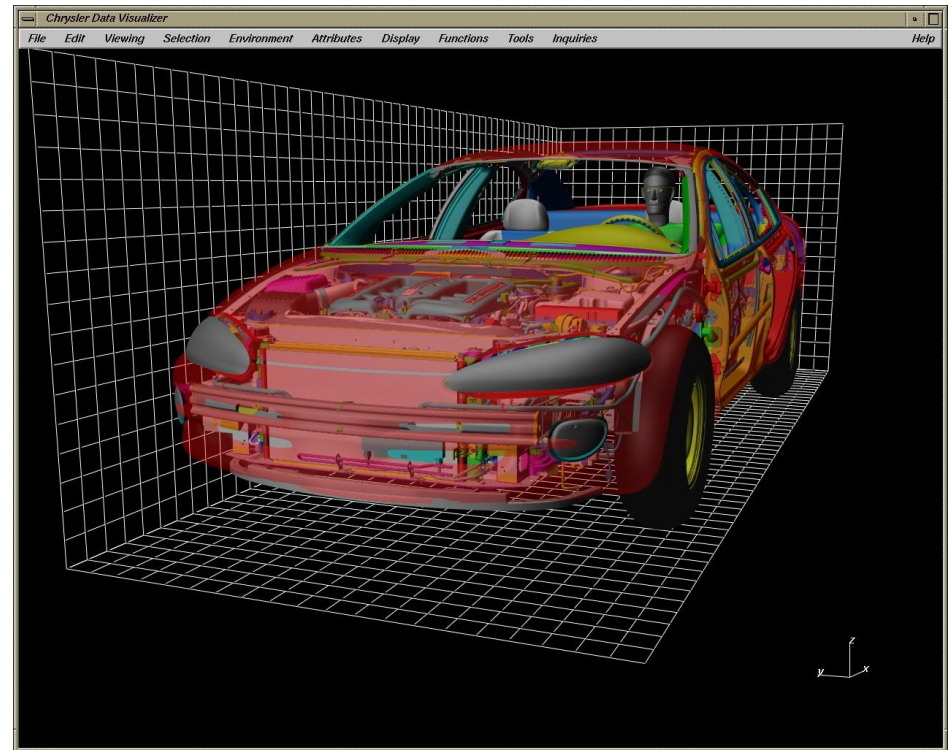
- **60% to 90% Reduction in Rework over Previous Programs**
- **Required Major Change in Culture**



# Virtual Dodge Intrepid

## Electronic Linkage of Product/Process Development :

- Development Time reduced 20%
- Resultant Savings of \$75M
- CATIA facilitated side-by-side involvement between development and plant engineers and product engineers since the beginning of the program



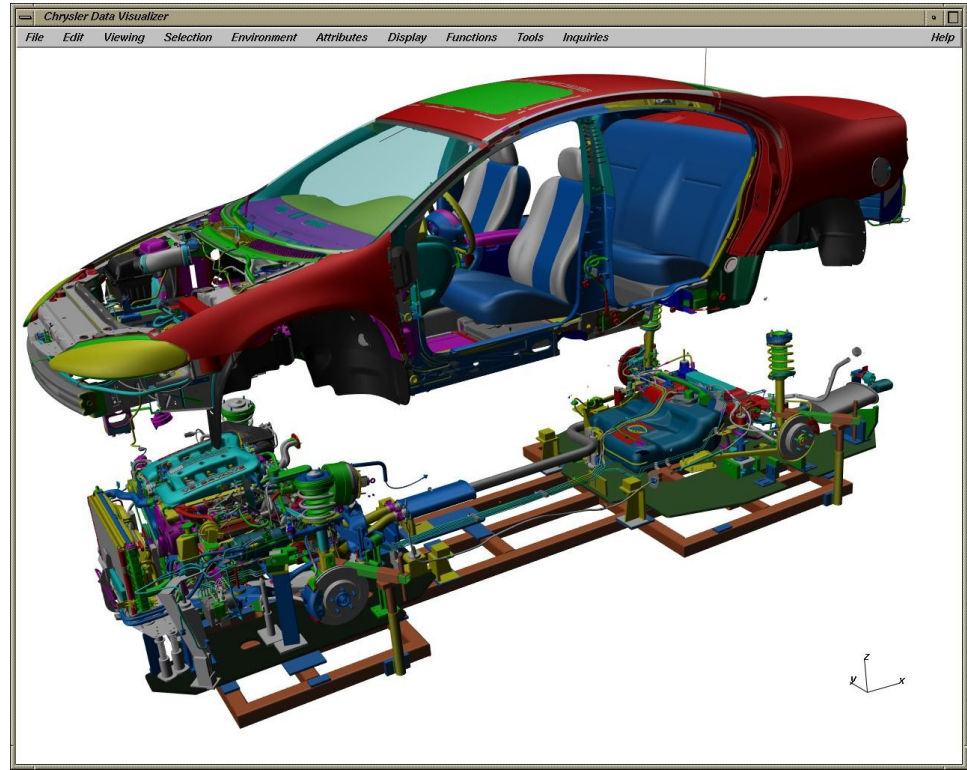
**Intrepid Virtual Prototype**



# Chrysler “Paperless” Engine

## Chrysler Eng/Mfg Process:

- **Digital Model Assembly (DMA) - component & system packaging and design for assembly using CATIA**
- **Development time for engine cut by 26 weeks using CATIA for predictive modeling and rapid prototyping**
- **Compressed development time w/ thousands more designs**



**1st “Paperless Designed Engine”**



# Recent Activities

- **US Army SBA Symposium -  
January 1998**  
**Attendance by PEOs, PMs, Acquisition Workforce**  
**Acquisition Leadership introduces concept of SBA**
- **NDIA SBA Workshop -  
March 1998**  
**Attendance by Industry Government**  
**Recommendations to Acquisition Council**
- **Acquisition Council SBA Task Force and Roadmap -  
Joint Task Force with Service Membership (on-going)**  
**Provide actionable recommendations for  
establishing SBA**
- **Proposed Changes to DOD 5000 -  
Require Planning of M&S use throughout**





# COMANCHE (RAH-66)

**Army Flagship M&S-Based ACAT I development program...**  
**Total program costs - \$7.9B w/ \$34M (1/2%) for M&S**

**Use of Computer Aided Three-Dimensional Interactive Simulation (CATIA) achieved 95% first time design fit as opposed to 35% in previous processes.**

**Estimated total cost avoidance - \$673M**

- flt controls            \$447M**
- crew station         \$103M**





# CRUSADER

- With use of M&S early in design cycle, logical errors and requirements ambiguities are caught before design is tested or implemented
- Use of M&S evolved from utilizing CAD; to animating CAD designs; to adding 95% soldier into animation to optimize design.
- T&E of Virtual prototype identified interference of auto loader arms & verified one arm can meet exit criteria.



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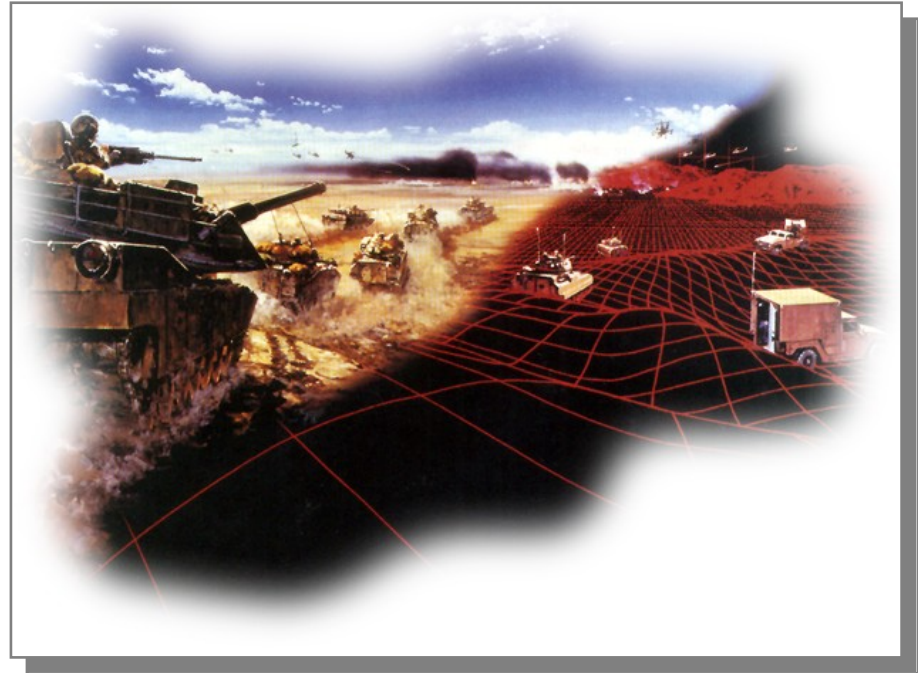
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# Force-on-Force Modeling

- **Stochastic, Event-Sequenced Opposing Force Simulation**
- **Accredited for Combined Arms Studies**
- **High Resolution Portrayals of Systems, Munitions, Firing Events, and Fog of War Environment**
- **Assists in System Design and Requirements Definition**



MLA2: CASTFOREM used to develop the COEA for Milestone II and Milestone III.

- **LOSAT: CASTFOREM used to evaluate design alternatives for combat effectiveness.**



# Digital End-To-End Simulation

## PAC-3 Simulation

- ➔ **Simulation of Patriot Engagement with PAC-3 Missile From System Emplacement through Lethality Assessment**
- ➔ **Demonstrates Compliance with Majority of System Performance Related Requirements and Supports Milestone III**
- ➔ **Combines Several Models to Form Highest Fidelity End-to-End Simulation of PAC-3 System**
- ➔ **Provides 1-on-1 Performance Estimates and Pk Estimates**



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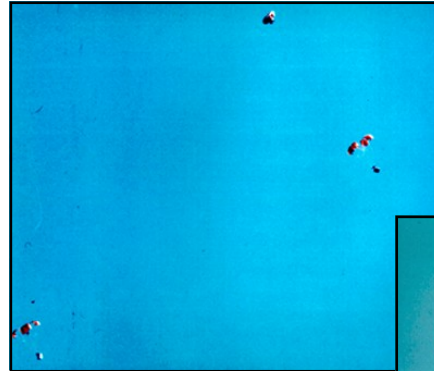




# Virtual Prototyping

## ARL Collision Simulation

- Representation of SADARM Submunitions in Airstream
- Developed to Determine Airflow of Submunitions
- Provides for Design Modification to Eliminate Collision Effects of Submunitions
- Supports Analysis of Separation Distances Versus Time Between Two Submunitions



**"If there had been a model created early in the program of two submunition bodies spinning off axis during the initial stages of development, which would have analyzed the adverse effects of colliding submunitions, a different design may have been selected."**

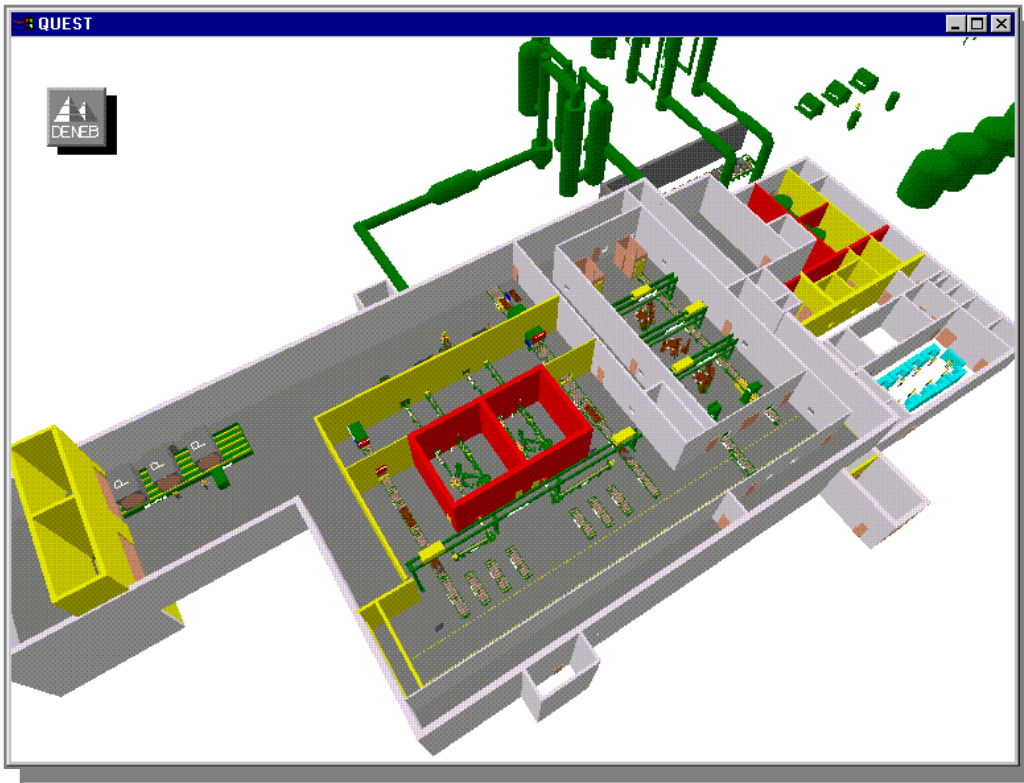
***SADARM Deputy***

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SBA 1 PM



# Computer Aided Manufacturing



**Tooele Chemical Agent Disposal Facility (TOCDF) Model**

- **Establish Plant Performance Standards for Use in Comparisons of Alternative Facility, Campaign, and Process Configurations**
- **Provide Indication of the Effectiveness of Plant Improvements Over Time as a Result of Lessons Learned**
- **Suggest Areas for Future Modifications to Improve Throughput and Availability**
- **Conduct Reliability, Availability, and Maintainability (RAM) of**

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SBA Implementation

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# What Enables SBA for the Army?

- **Planning/Management Tool**
- **Provides visibility of M&S efforts**
- **Executable vs. Strategic Planning**
- **Identifies opportunities for collaboration via M&S between ACR/RDA/TEMO Domains**
- **Endorsed by Mr. Longuemare:**  
“...guidelines are a good example of how acquisition

**Air Force Wants to Use the Army Guidelines As Basis for Their M&S Planning Guidance**



## Simulation Support Plan Guidelines



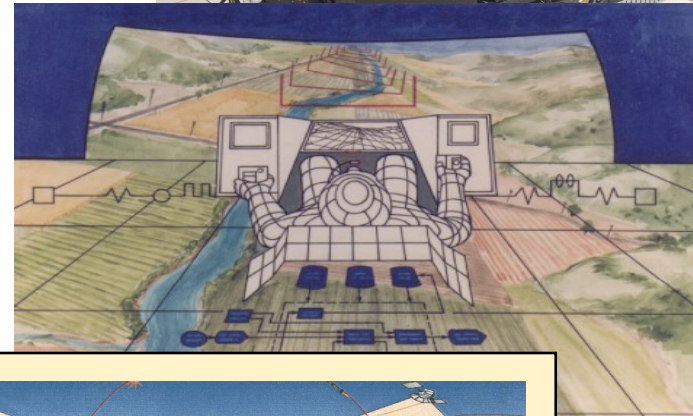


# Technological Enablers of SBA

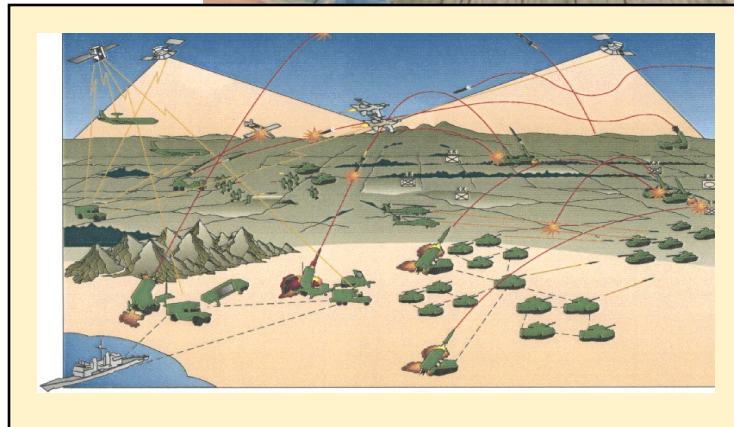
- **2nd Generation Image Generator - enable more realistic training and mission rehearsal**



- **High Performance Computing on Desk Top**



- **Web Technology to Support Integrated Digital Environment (IDE)**







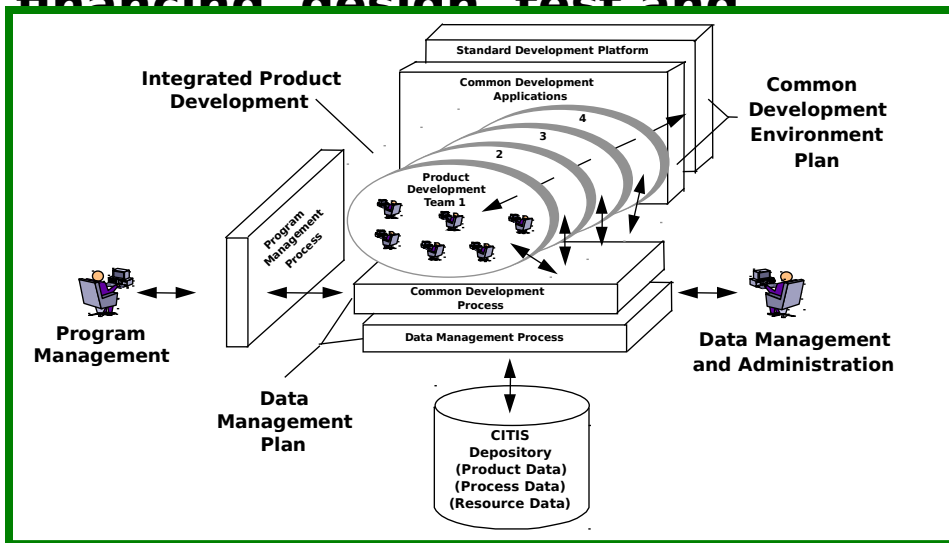
# Paperless Implications for SBA

## ***Deputy Secretary of Defense Mandate for Digital Acquisition by 2002:***

- PMs establish Integrated Digital Environment in which to conduct acquisition functions to include program management, contracting, financing, design, test and

- SBA leverage IDE to support seamless data transfer across acquisition functions, phases, and programs

- IDE facilitates seamless data transfer between ACR/RDA/TEMPO domains to support Smart Product Model initiative, system supportability, training, etc..



**Combat Mobility  
Systems distributed  
Integrated Digital  
Environment**



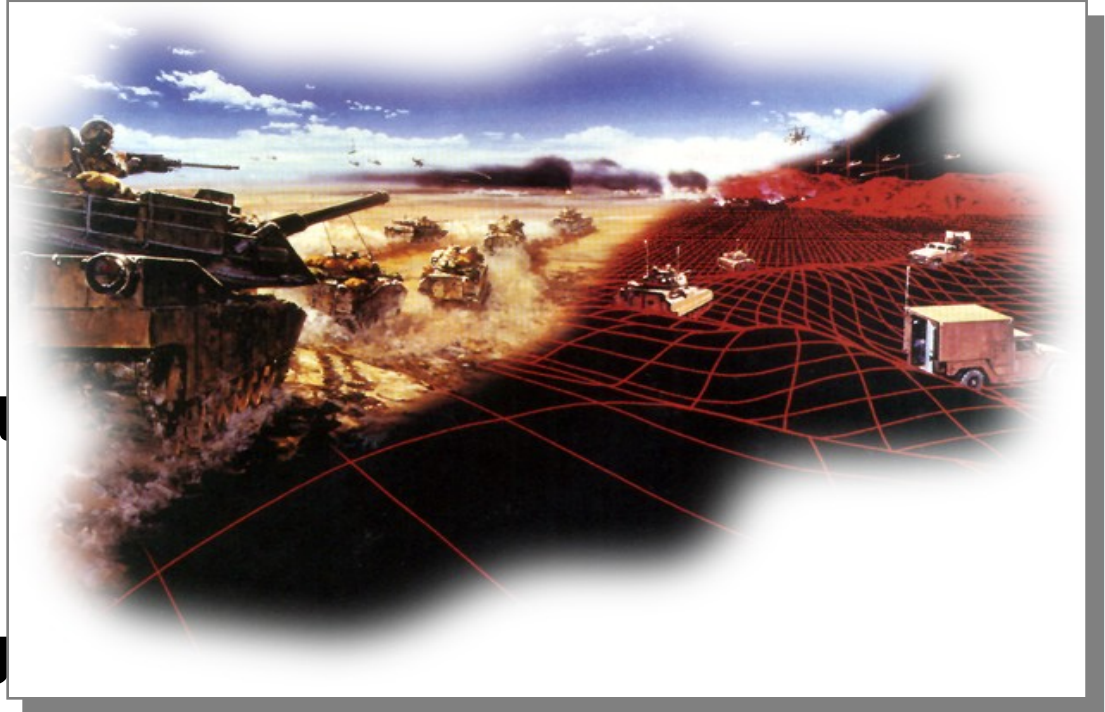
# DARPA Smart Enterprise Model





# Implications of RDA/ACR Interface

- **Cost/Performance Tradeoff Analysis**
- **Early ID of unrealistic requirements**
- **Early ID of enabling Technologies**
- **Earlier Opportunity to Address Life cycle cost**
- **Use Smart Product Models to aid Threat Assessment & Mission Area Analysis**





# Implications of RDA/TEMO Interface



- Assess impact of TTP & Doctrine on design concepts
- Trained crew simultaneous w/ 1st unit off production line
- Re-use of software & simulation to support embedded



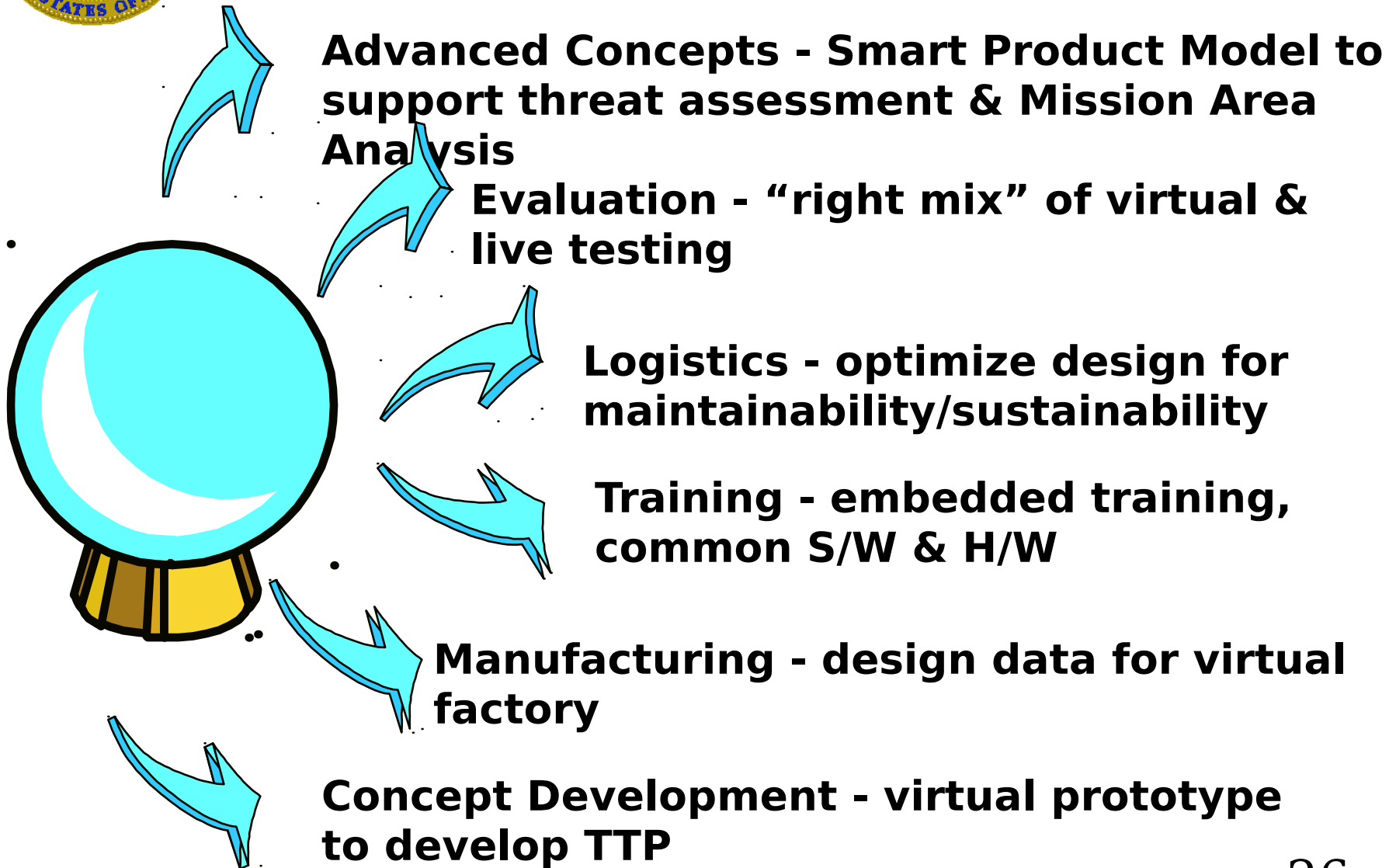


# A Roadmap for SBA





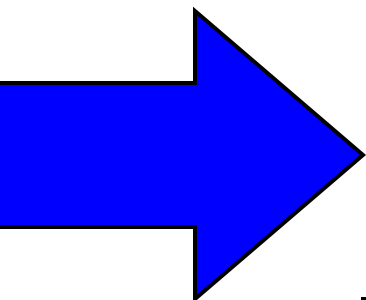
# SMART Future Vision





# Conclusion.....



**SBA**  **SMART**